

many wells have failed, and farmers have to haul water for stock.

Ruggles, Ashland Co., Ohio, 31st: very dry and water scarce.

Tiffin, Seneca Co., 31st: water has become scarce in this section of the state as a result of the continued dry weather.

West Milton, Miami Co., Ohio, 31st: on account of the long continued drought there is in some localities a great scarcity of water; wheat is suffering in consequence of drought.

Strafford, Orange Co., Vt., 31st: springs are low and fall pasturage has suffered in consequence of the dry weather.

The October report of the "Indiana Weather Service" states:

The total deficiency in precipitation during the month was 2.74 inches and since January 1, 1887, 13.21 inches. So great a deficiency, extending over so many months preceding October, surpasses any former droughts on record. From every part of the state, especially from the southern and central sections, reports have been received as to scarcity of water, and the evils consequent on such protracted drought are felt in many localities. Creeks and surface wells have become dry; wheat either has not come up at all or has turned yellow in many fields, and cattle are suffering from want of water, which has to be brought to many farms from great distances. The observer at Vevay reports that the Ohio River has been lower than noted for many years.

SLEET.

Sleet fell at scattering stations, mostly in the Northern States and territories, during the month on the following dates: 1st, 7th, 10th to 12th, 14th, 20th to 25th, 29th, 30th.

SNOW.

Reports show that snow fell in some part of the country on every day during the month, with the exception of the 1st, 2d,

and 27th. The snowfalls were, in general, light and, in many instances, local. From the 20th to 25th snow was of more general occurrence than during any other period of the month; on the 21st, 22d, and 23d it was reported from nearly all stations in the Lake region, and at many in the extreme northwest, New England, and the middle Atlantic states.

MONTHLY SNOWFALLS (in inches and tenths).

The following stations report monthly snowfalls of one inch or more:

Colorado.—Denver, 3.1. Dakota.—Deadwood, 13.1; Fort Buford, 11.5; Richardton, 2.8; Fort Totten, 1. Iowa.—Bancroft, 5. Michigan.—Marquette, 10.8; Alpena, Escanaba, and Harrisville, 1.5. Minnesota.—Minneapolis, 2. Montana.—Fort Maginnis, 20.2; Helena, 8.3; Poplar River, 7.8; Fort Custer, 1.1. Nebraska.—Hay Springs, 3; Valentine, 1.7; North Platte, 1.1. North Carolina.—Marion, 2. Ohio.—Garrettsville, 2.5; Cleveland, 1.4. Pennsylvania.—Erie, 3.5; Corry, 3; Washingtonville, 2; Wellsborough, 1.1. Utah.—Frisco, 4.2. Virginia.—Marion, 5 to 6; Wytheville, 1. Wisconsin.—Green Bay, 10.1; La Crosse, 2.5. Wyoming.—Cheyenne, 4.5; Fort Bridger, 2.

The only station reporting snow on the ground at end of month is Marquette, Mich.; depth, one inch.

HAIL.

Hail is reported to have fallen in various parts of the country from the 2d to 5th, 10th, 11th, 13th to 21st, 23d to 25th, 29th to 31st; it was most numerous reported on the 11th and from the 21st to 25th.

WINDS.

The most frequent directions of the wind during October, 1887, are shown on chart ii, by arrows flying with the wind. In the northern districts from the Rocky Mountains eastward to the Atlantic coast the prevailing winds are generally from southwest, west, or northwest; in the Southern States, northwest, north, or northeast; in the Rocky Mountain and Pacific coast districts, variable.

HIGH WINDS (in miles per hour).

The maximum velocities of the wind for October, 1887, at Signal Service stations where the movements are registered, are given in the table of miscellaneous meteorological data. But one station reports a velocity exceeding 50 miles per hour other than the maximum for the month, viz., Buffalo, N. Y., 60 miles, sw., on the 3d and 4th.

LOCAL STORMS.

La Crosse, Wis.: a severe thunder-storm occurred at this place from 12 to 1 a. m. on the 7th; hail, accompanied by light rain, fell for about twenty minutes, the hail-stones were quite large, some measuring two by one and one-half inches, but most of them were of the size of marbles.

Wellington, Sumner Co., Kans.: unusually heavy showers prevailed from 2.30 p. m. on the 7th until 10.30 a. m. on the 8th, 6.02 inches of rain having fallen in twenty hours. Much benefit has been derived from this rain; the fall-sown wheat was placed in good condition.

Key West, Fla.: a gale prevailed from 9.45 a. m. until 3 p. m. on the 8th, reaching a maximum velocity of thirty miles per hour at 12.25 p. m., and continuing at that rate until 1 p. m. Heavy rain fell from between 7 and 8 p. m. until after midnight, flooding the streets.

Riverside, San Bernardino Co., Cal.: on the 11th, at 12.45 p. m., a rain storm, accompanied by hail and light thunder. At 12.40 p. m. clouds from two directions appeared to meet in the southeast with a loud, rushing noise, similar to the approach of

a tornado. The track of the storm was about four miles wide, coming from the southeast, although the track of the heaviest hail was not more than a mile in width. The hail-stones were from an inch and a quarter in diameter down.

New Orleans, La.: a wind storm began 9.52 p. m. on the 11th and ended 9.04 a. m. the following day; maximum velocity, thirty miles per hour, from the north.

Brownsville, Tex.: fresh to brisk northerly winds and heavy rain began during early a. m. and ended 11.20 a. m. on the 11th, 5.60 inches of rain falling during the storm. The Rio Grande River overflowed, but fell rapidly during the 12th. Heavy rain began 1.45 p. m. on the 21st, changing to light rain 3.50 p. m. and ending 9.10 p. m. The rain during the first two hours was very heavy, 2.48 inches having fallen from 1.45 to 3 p. m.; the streets were flooded to a considerable extent.

Wood's Holl, Mass.: a storm began 10.40 a. m. and ended 12.40 p. m. on the 13th; maximum velocity, forty-two miles, from the southwest, occurred 2.55 p. m.

Titusville, Fla.: light and heavy rains prevailed during the 16th; total precipitation 3.33 inches; the rain was accompanied by high winds, reaching a velocity of thirty-eight miles per hour. The railroad bridge over Deep Creek, about twenty miles northeast of this place, was seriously damaged by the flood which resulted from the heavy rain, and the railroad track near the bridge was washed out about one-half mile.

Galveston, Tex.: a gale began 4.20 a. m. on the 18th, reaching a velocity of forty-eight miles per hour at 5 p. m.

Valentine, Nebr.: a gale began 8.35 a. m. on the 19th and continued until 6.40 p. m. on the 20th; maximum wind-velocity, fifty-four miles per hour from the north, occurred on the 19th.

WATER-SPOUT.

Capt. A. McDougall, of the s. s. "Caspian," reports: "October 6th, in N. 39° 32', W. 69° 10', at 10.35 a. m., wind n. by w., force 6, barometer 29.80; vivid lightning to se. and nw., with very loud peals of thunder; a very black squall made up

to the nw., with centre bearing nw. by w.; lightning disappeared from se., and squall passed rapidly to sw., at the same time raising a column of water about seventy feet high; could clearly observe water rushing down centre of spout and plough-

ing up the surface of the sea quite forty-five or fifty feet above level of the ocean. This was the largest water-spout I or other members of the crew ever saw. Wind kept steady in direction, but increased to force 7; barometer not affected."

COTTON REGION REPORTS.

In the following table are given the means of the maximum and minimum temperatures, and the average rainfall for the cotton-belt districts during the month. For the purpose of comparison the means for October of the five preceding years are also given.

Except in the districts of Memphis, Little Rock, and Galveston, the rainfall was largely in excess of the average; it was more than double the average in the districts of New Orleans, Savannah, Montgomery, and Mobile; for the Wilmington district it was more than four times the average, and for the Augusta district nearly three times the average. Marked deficiencies occurred in the districts of Little Rock and Memphis.

The means of the maximum and minimum temperatures were generally decidedly below the average for all districts, the departures exceeding 4° in the districts of Wilmington, Atlanta, Montgomery, Mobile, and New Orleans.

Temperature and rainfall data for the cotton districts, October.

Districts.	Rainfall.			Temperature.								Extremes for Oct., 1887.	
	Average for Oct. of five preceding years.	Average for Oct., 1887.	Departures.	Maximum.			Minimum.						
				Mean for Oct. of five pre- ceding years.	Mean for Oct., 1887.	Departures.	Mean for Oct. of five pre- ceding years.	Mean for Oct., 1887.	Departures.				
	Inch.	Inch.	Inch.	°	°	°	°	°	°	°	°	Max.	Min.
New Orleans.....	2.16	5.16	+ 3.00	80.0	75.9	- 4.1	58.4	53.9	- 4.5	97	28		
Savannah.....	2.09	4.23	+ 2.14	80.3	76.8	- 3.5	58.9	55.7	- 3.2	97	32		
Charleston.....	2.23	3.80	+ 1.57	77.1	74.5	- 2.6	54.3	53.7	- 0.6	88	35		
Atlanta.....	2.15	3.32	+ 1.17	75.3	70.5	- 4.8	53.3	49.3	- 4.0	90	26		
Wilmington*....	1.68	8.19	+ 6.51	76.3	70.1	- 6.2	53.4	50.1	- 3.3	93	27		
Memphis.....	2.25	2.02	- 0.23	75.3	71.7	- 3.6	51.5	47.6	- 3.9	89	24		
Galveston*.....	2.83	2.99	+ 0.16	80.6	77.9	- 2.7	58.6	55.0	- 3.6	95	28		
Vicksburg.....	2.57	3.90	+ 1.33	78.2	74.5	- 3.7	55.6	54.1	- 1.5	91	31		
Montgomery.....	1.31	3.40	+ 2.09	79.1	73.6	- 5.5	59.1	53.3	- 5.8	88	31		
Augusta.....	1.94	5.48	+ 3.54	76.8	72.4	- 4.4	53.8	50.7	- 3.1	96	30		
Little Rock.....	1.85	1.05	- 0.80	76.0	75.3	- 0.7	50.7	48.5	- 2.2	91	25		
Mobile.....	1.76	3.34	+ 1.58	79.6	74.4	- 5.2	55.3	48.8	- 6.5	93	27		

*Average for four years only.

INLAND NAVIGATION.

In the following table are shown the danger-points at the various river stations and the highest and lowest depths for October, 1887, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, October, 1887 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, La....	29.9	28, 29, 30	11.8	4, 2	1.4	7.6
<i>Arkansas River:</i>						
Fort Smith, Ark....	22.0	13	9.4	4, 5, 6	0.7	8.7
Little Rock, Ark....	23.0	16	8.5	9, 10, 11	1.6	6.9
<i>Missouri River:</i>						
Omaha, Nebr.....	18.0	1	7.2	20, 25-31	5.7	1.5
Leavenworth, Kans.	20.0	1	8.3	24	6.6	1.7
<i>Mississippi River:</i>						
Saint Paul, Minn....	14.5	9, 13, 17, 24	2.0	2, 3, 26-28	1.7	0.3
La Crosse, Wis....	24.0	21-26	3.4	29-31	2.9	0.5
Dubuque, Iowa....	16.0	25, 26	3.7	2, 4, 9-13	3.3	0.4
Davenport, Iowa....	15.0	1-9	2.5	11-20, 22, 23, 27-31	2.3	0.2
Keokuk, Iowa.....	14.0	1	2.6	21, 22, 25-27, 29-31	1.9	0.7
Saint Louis, Mo....	32.0	1	8.5	27, 30, 31	5.7	2.8
Oairo, Ill.....	40.0	1, 2	5.2	27	2.4	2.8
Memphis, Tenn....	34.0	1	5.4	29-31	2.8	2.6
Vicksburg, Miss....	41.0	1	2.8	31	- 1.8	4.6
New Orleans, La....	13.0	16	4.2	31	1.9	2.3
<i>Ohio River:</i>						
Pittsburg, Pa.....	22.0	10, 26	6.1	24, 25	5.7	0.4
Cincinnati, Ohio....	50.0	7	4.9	18-20, 25, 26	2.8	2.1
Louisville, Ky....	25.0	1, 9	2.6	14	1.9	0.7
<i>Cumberland River:</i>						
Nashville, Tenn....	40.0	4	1.9	19-23	- 0.2	2.1
<i>Tennessee River:</i>						
Chattanooga, Tenn.	33.0	28	4.7	15-17	1.2	3.5
<i>Monongahela River:</i>						
Pittsburg, Pa.....	29.0	10, 26	6.1	24-25	5.7	0.4
<i>Savannah River:</i>						
Augusta, Ga.....	32.0	28	12.0	16	5.7	6.3
<i>Sacramento River:</i>						
Red Bluff, Cal.....	.....	11-18	0.6	1-10, 19-31	0.5	0.1
Sacramento, Cal....	.....	1-31	7.2	1-31	7.2	0.0
<i>Willamette River:</i>						
Portland, Oregon....	.....	1	3.5	25	0.0	3.5

STAGE OF WATER IN RIVERS AND HARBORS.

Toledo, Ohio: navigation on the Maumee River was suspended on account of low water on the 3d. The high wind

which prevailed during the night of the 2-3d drove the water out of the river into the lake, leaving several vessels aground. At Perrysburg, about ten miles southwest of Toledo, the Maumee River was lower than has been known for many years, a large part of the river bed being completely bare.

Cairo, Ill.: owing to the low stage of water in the Ohio River on the 12th the steamer "Gus Fowler" ran aground near Mound City. On the 27th the river reached the lowest stage since January, 1887. The Illinois Central Railroad company was compelled to extend its cradles farther into the river to enable the transfer steamers to reach them. The low water in both the Mississippi and Ohio rivers has caused a practical suspension of navigation, resulting in great inconvenience and heavy losses.

ICE IN RIVERS AND HARBORS.

Moorhead, Minn.: the Red River of the North froze the 24th. Fort Buford, Dak.: the Missouri River froze over during the night of the 24-25th, ice forming to a thickness of two inches. On the 26th the ice broke up and passed down. The river was very low during the greater part of the month.

Cedar Rapids, Linn Co., Iowa: for the first time in October for many years Cedar River froze over, on the 25th.

HIGH TIDES.

Jacksonville, Fla.: the tide was unusually high at the mouth of the Saint John's River on the 15th.

Atlantic City, N. J.: during the morning of the 18th the tide was very high and caused some damage to the board walks; the beach was washed away in some places.

Wellfleet, Mass.: the highest tide ever known in this vicinity occurred on the 21st; the lower streets of this place were flooded.

The voluntary observer at Taunton, Mass., states that during the week ending October 23d the tides were unusually high.

The Signal Service observer at Kitty Hawk, N. C., reports high tides on the 30th and 31st.